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ABSTRACT

Perceived influences of biology and English department heads were investigated using a discriminant analysis test of Biglan's model. Attention was directed to the influence of discipline versus the structural variables of department size, type of institution, and highest degree awarded. Questionnaires completed by 586 heads of biology and English departments provided estimates of the level of their influence in 19 functional areas commonly associated with chairing academic departments. It was found that discipline is of secondary importance in explaining the variance in responses of department chairpersons to questions dealing with perceived influence. In both English and biology departments, the mean influence value for chairpersons in small departments was less than that of those of medium size, which was in turn less than that of those in large departments. There was a significant increase in both disciplines in the mean perceived influence value with each successively higher degree awarded. Using stepwise discriminant function analyses, discipline in combination with highest degree and department size accounted for more of the variance than did discipline. The findings are presented in 3-dimensional graphics by plotting the group centroids against the discriminant functions. (SW)

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A DISCRIMINANT ANALYTIC TEST OF BIGLAN'S THEORETICAL DISTINCTION BETWEEN BIOLOGY AND ENGLISH DEPARTMENT CHAIRPERSONS

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ABSTRACT

A DISCRIMINANT ANALYTIC TEST OF BIGLAN'S THEORETICAL DISTINCTION BETWEEN BIOLOGY AND ENGLISH DEPARTMENT CHAIRPERSONS.

Discriminant function analysis was used to compare the structural variables of department size, type of institution and highest degree awarded with academic discipline to determine which accounts for more variance in the responses of chairpersons from biology and English departments to questions concerning their perceived influence. In most cases, the structural variables accounted for more of the variance than does discipline. The data are presented graphically by plotting the group centroids against the discriminant functions. The implications of these findings for administrators in institutions of higher education are discussed.

A DISCRIMINANT ANALYTIC TEST OF BIGLAN'S THEORETICAL DISTINCTION BETWEEN BIOLOGY AND ENGLISH DEPARTMENT CHAIRPERSONS

INTRODUCTION

In 1973, Biglan published the first definitive statement concerning the relationship among academic disciplines. He systematically collected and analyzed the responses of a large group of scholars from different academic disciplines to questions concerning their perceptions of subject matter similarities among numerous academic areas. He found that regardless of the field in which the faculty member was trained, each respondent perceived the same degree of similarity among the listed fields. This result enabled Biglan to identify three dimensions along which various disciplines could be separated. These were (a) the degree to which a paradigm exists (hard versus soft), (b) the degree of concern with application (pure versus applied), and (c) the degree of concern with life systems (life versus nonlife) (Biglan, 1973a). Once he had divided these disciplines according to the dimensions above, Biglan went on to look at differences in structure and output of departments which fell within these various categories. He found that structure and output of university departments were related to the same three dimensions (Biglan, 1973b). Specifically, he noted that those departments which had agreed upon a paradigm tended to work closely together on research activities and were more committed to research than to teaching. Members of these departments tend to publish journal articles instead of monographs. Those departments which were concerned with application tended to emphasize service, to emphasize the publication of technical reports, and to rely heavily on colleague evaluations. Departments concerned with living systems tended to work as a group in training graduate students and to place less emphasis on teaching than the non-life departments.

Biglan concluded that discipline makes a difference when considering the organization of academic departments. He warned that lumping all disciplines together in order to generalize about the academic organization as a whole may mask some real differences and result in poor decisions based on a hypothetical "department" which, in fact, does not exist. Biglan's study suggested that it may be essential to use quite different strategies in the management of different disciplines within the academic enterprise.

In the decade following the publication of the Biglan model a number of studies were carried out which confirmed many of Biglan's findings (Fiedler and Gillow, 1974; Smart and Elton, 1975; Smart and Elton, 1976; Creswell, Seagren, and Henry, 1979; Creswell and Bean, 1981; Muffo and Langston, 1981). A consideration of all of these studies lead Smart and Elton (1982) to conclude that

> given the results of studies to date, the Biglan model appears to offer particular promise for inquiries into areas of organizational and management characteristics of academic departments and differential factors associated with the career success and satisfaction of faculty in different subject matter areas. (Page 226)

Most of the studies used to confirm the Biglan model were limited to a single institution or a single type of institution or a single state system. These approaches were appropriate since the researchers were attempting to determine whether or not differences by discipline existed independent of the confounding factors imposed by other characteristics of the institutions in which the individual departments resided. The present study attempts to resolve whether the differences between certain academic disciplines are more or less important than those imposed by the type of university (i.e. whether private or public), the size of the department (i.e. the number of full-time faculty members), or the highest degree awarded by the department.

METHODS

Chairpersons of biology and English departments are the subjects of the current study. These two disciplines were chosen because they represent rather widely separated disciplines in the Biglan classification, but not so widely separated as to be documenting the obvious. Biology departments are classified by Biglan as pure-hard-life while English departments fall into the pure-soft-nonlife category of the scheme. Questionnaires were sent to the chairpersons of biology and English departments at 384 institutions. These institutions represent about one-third of the English departments listed in the Association of Departments of English (ADE) Bulletin and approximately the same fraction of the biology departments as listed in the American Institute of Biological Sciences (AIBS) Directory. All 50 states are represented and both public and private institutions are included. Both graduate and exclusively undergraduate institutions, but not community colleges, are included in the sample. A total of 586 questionnaires were returned for a response rate of 76 percent. The chairpersons in both disciplines were asked to estimate the level of their influence in nineteen functional areas commonly associated with chairing academic departments.

Responses were analyzed by the Cyber 730B at the Florida State University Computing Center, using the Statistical Package for the Social Sciences, Version 9.0 (Brown, 1985; Hull and Nie, 1981; Nie, et. al., 1975; and Tabachnick and Fidell, 1983). Responses to all 19 of the questions on perceived influence were used as discriminating variables for stepwise discriminant function analyses. The groups to be discriminated by these analyses were defined by university type, department size, or highest degree awarded in combination with discipline. The functions were generated to

maximize Rao's V, a generalized measure of distance between group centroids (Tabachnick and Fidell, 1983). For ranking means of the responses of the influence questions in comparing English and biology departments the Kruskall-Wallis H test was used (Downie and Starry, 1977).

RESULTS

Chairpersons in all three disciplines were asked to estimate the level of their influence in 19 functional areas commonly associated with chairing academic departments. These functional areas are listed in Table 1 and are presented with the means for each discipline. The number in parenthesis following the mean score indicates the rank of the mean within each discipline. A nonparametric analysis (Downie and Starry, 1977) of these ranks using the Mann-Whitney U ($Z = 10.5$) test shows them to be significantly different ($P < 0.01$).

If a mean value for the influence levels reported for all 19 functional areas listed in Table 1 is computed for each chairperson, the resulting value is an estimate of that chairperson's overall level of influence. The average values obtained for chairs within each discipline can be analyzed with other variables to determine which has a greater impact upon perceived influence. In both English and biology departments the mean influence value for chairpersons in small departments is less than that of those in departments of medium size which is in turn less than that of those in large departments. Analysis of variance indicated that the differences in mean influence values are significant for both disciplines (Table 2). The same pattern holds true when the highest degree awarded by the institution is considered. There is a significant increase in both disciplines in the mean perceived influence value

Table 1

Perceived Influence in Functional Areas by Discipline

Function	Mean Score* English	Biology
Administration of Budget	4.52 (1)	4.63 (1)
Class Scheduling	4.31 (2)	4.10 (6)
Allocation of Department Resources to Faculty	4.26 (3)	4.31 (3)
Recruitment and Hiring of Department Faculty	4.23 (4)	4.03 (9)
Formation of Committees and Assignments	4.20 (5)	4.13 (5)
Maintaining Faculty Morale	4.20 (6)	4.14 (4)
Determination of Department Goals and Objectives	4.04 (7)	4.03 (8)
Faculty Evaluation	4.01 (8)	4.04 (7)
Formulation of Department Budget	3.96 (9)	4.32 (2)
Reappointment or non-reappointment decisions	3.92 (10)	3.90 (11)
Faculty Promotion Decisions	3.78 (11)	3.84 (12)
Curriculum Development	3.75 (12)	3.73 (14)
Tenure Decisions	3.72 (13)	3.74 (13)
Fostering Good Teaching	3.63 (14)	3.63 (15)
Faculty Salary Decisions	3.44 (15)	3.57 (17)
Determination of Department Academic Standards	3.43 (16)	3.61 (16)

Table 1 - continued
Perceived Influence in Functional Areas by Discipline

Function	Mean Score*	
	English	Biology
Faculty Teaching Loads	3.40 (17)	4.01 (10)
Institutional Policies and Goals	2.86 (18)	2.65 (19)
Procurement of Research Funds	2.66 (19)	3.02 (18)

*Note: Scale is Very Little or No Influence 1 2 3 4 5 Significant Influence

Table 2

Analysis of Variance: Mean Perceived Influence of
English and Biology Department Chairpersons by Department Size

Discipline		Department Size			Sources	DF	Sum of Squares	F Ratio	F Prob.
		Small (2-13)	Medium (14-25)	Large (> 26)					
	Number	76	85	139	Between Groups	2	5.78	9.34	.0001
English	$\bar{x}$ Influence	3.6	3.8	3.9	Within Groups	298	92.28		
	SD	.53	.64	.50	Total	300	98.06		
	Number	73	84	121	Between Groups	2	5.89	9.52	.0001
Biology	$\bar{x}$ Influence	3.6	3.8	3.9	Within Groups	275	85.11		
	SD	.53	.64	.50	Total	277	91.00		

with each successively higher degree awarded (Table 3). When university type is taken into consideration the values for mean influence for public institutions are greater than for private institutions in both English and biology departments. However, the difference between public and private institutions is not significant at the .05 level in either biology and English departments (Table 4).

The perceived influence of the chairpersons in the 19 functional areas was used to generate the functions in stepwise discriminant function analyses (DFA). All functions generated were significant (Wilks' lamda and associated Chi-squared guard statistics) except as noted. The functions generated to discriminate between all possible combinations of discipline (biology and English) with (small, medium, and large) department size result in a Rao's V of 404.1 with $P < .0001$. The group centroids on the first three functions generated are plotted in Figure 1. Small, medium, and large departments represented by the numbers 1, 2, and 3 respectively are separated along the first function (accounts for 50% of total variance). English departments (open circles) are separated from biology departments (closed circles) along the second function (accounts for 20% of variance). Small biology departments and medium and large English departments are separated along the third function (accounts for 10% of variance). The fact that Function 1 separates by size and Function 2 by discipline indicates that differences in perceived influence among the groups analyzed are more closely associated with the size of the respondent's department than to their discipline.

The functions generated to discriminate between all possible combinations of biology and English with bachelors, masters, and doctorate granting institutions using the variables dealing with influence, yield a Rao's V is

Table 3

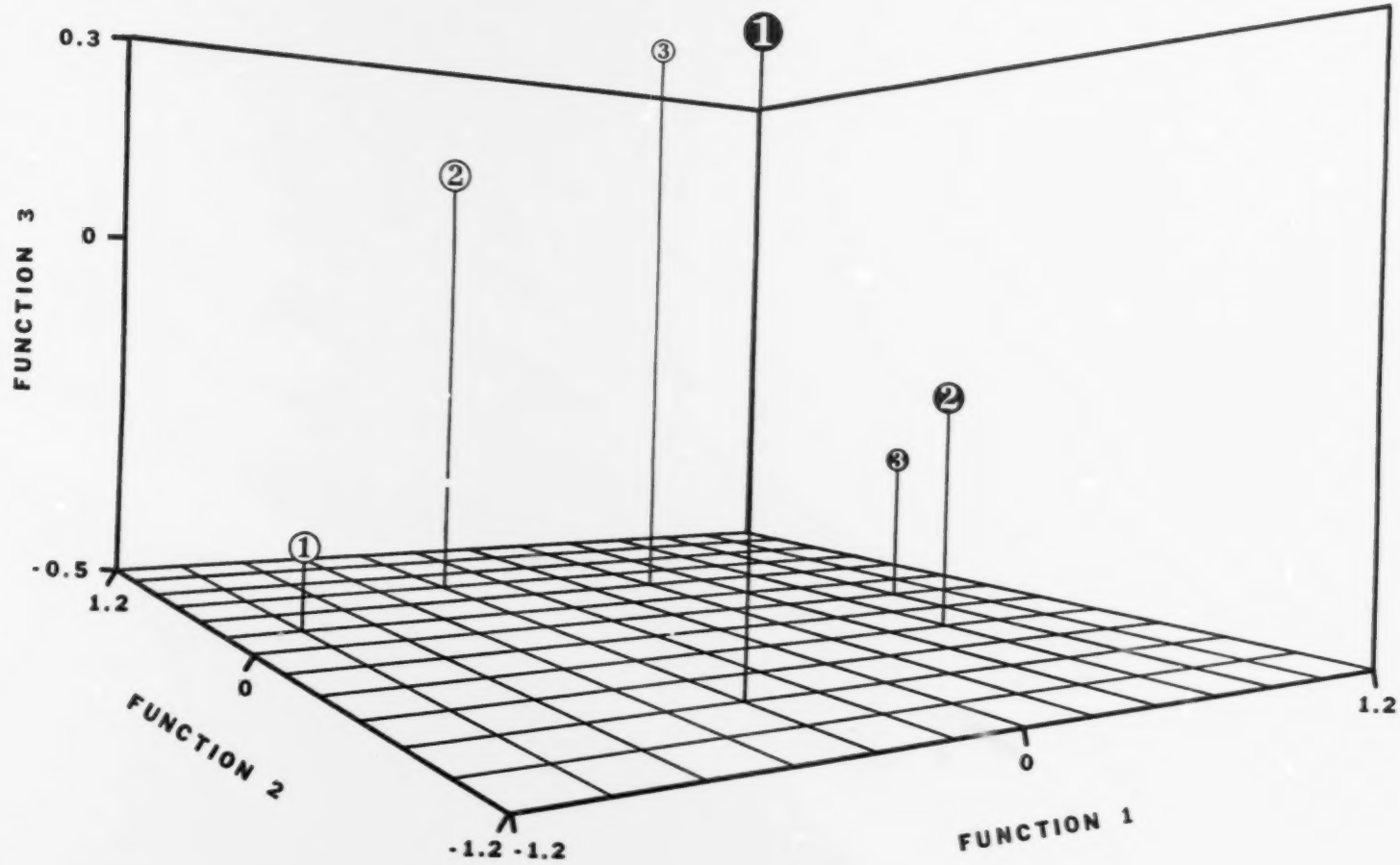
Analysis of Variance: Mean Perception of Influence of English and Biology Department Chairpersons by Highest Degree Awarded

Discipline		Highest Degree Bach.	Mstr.	Dctr.	Sources	DF	Sum of Squares	F Ratio	F Prob.
	Number	92	108	100	Between Groups	3	6.79	7.36	.0001
English	$\bar{x}$ Influence	3.60	3.85	3.94	Within Groups	297	91.28		
	SD	.65	.48	.53	Total	300	98.06		
	Number	88	95	94	Between Groups	3	6.31	6.80	.0002
Biology	$\bar{x}$ Influence	3.60	3.83	3.95	Within Groups	274	84.69		
	SD	.64	.49	.53	Total	277	91.00		

Table 4

Analysis of Variance: Mean Perceived Influence of English and Biology Department Chairpersons by University Type

Discipline		Type of University Public	Private	Sources	DF	Sum of Squares	F Ratio	F Prob.
	Number	176	125	Between Groups	1	1.18	3.64	.057
English	$\bar{x}$ Influence	3.86	3.73	Within Groups	299	96.88		
	SD	.52	.63	Total	300	98.06		
	Number	153	125	Between Groups	1	0.97	2.97	.086
Biology	$\bar{x}$ Influence	3.85	3.73	Within Groups	276	90.03		
	SD	.52	.63	Total	277	91.00		



Figures 1. Group Centroids (Discipline, Department Size): Discriminant Functions Generated from the Variables Dealing with the Perceived Influence on the Chairperson. Biology = closed circles; English = open circles; small departments = 1; medium departments = 2; large departments = 3. Separation of group centroids in multivariate space is significant at $P < 0.01$ (pair-wise F-test).

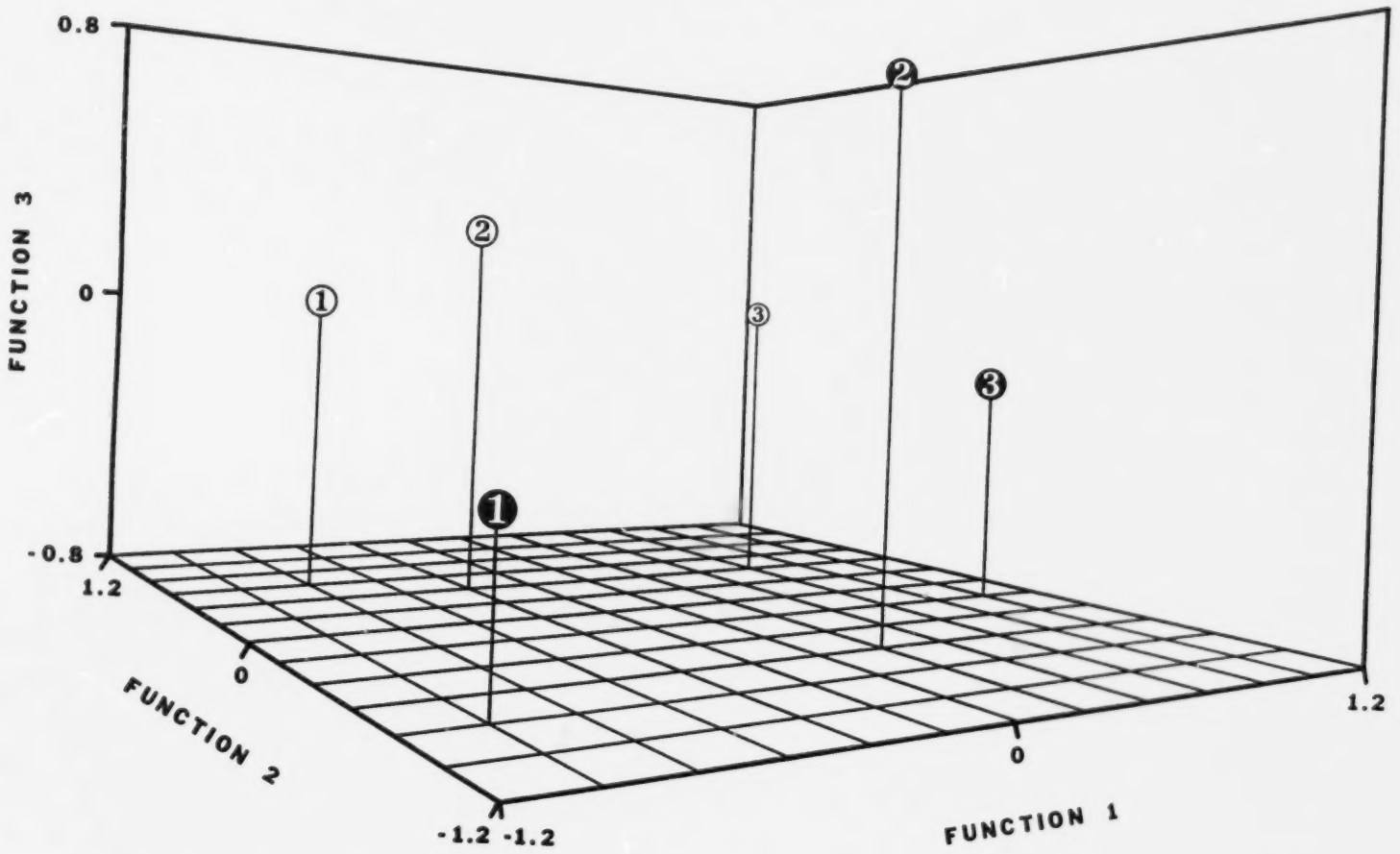


Figure 2. Group Centroids (Discipline, Highest Degree): Discriminant Functions Generated from the Variables Dealing with the Perceived Influence of the Chairperson. Biology = closed circles; English = open circles; Bachelor's = 1; Master's = 2; Doctorate = 3. Separation of group centroids in multivariate space is significant at $P < 0.01$ (pair-wise F-test).

489.39 with P < .0001. The group centroids on the first three functions generated are plotted in Figure 2. On this figure, it can be seen that bachelors, masters, and Ph.D. granting institutions (1, 2, and 3 respectively) are separated very well along the first function (accounts for 54% of total variance), and that English (open circles) and biology (closed circles) are separated well along the second function (accounts for 25% of variance). The third function separates master's granting institutions from the others in both disciplines (accounts for 10% of variance). In both disciplines the bachelors, masters, and doctoral granting institutions are in the same order along Function 1 with the masters granting institutions being more closely associated with the Ph.D. granting institutions among biology departments and more closely associated with bachelors granting institutions among English departments. Once again, the structural variable (in this case highest degree) is found to be more important than discipline with respect to perceived influence.

The functions generated to discriminate among all possible combinations of biology and English departments and public and private institutions using the variables dealing with influence yield a Rao's V is 250.21 with P < .0001 (Figure 3). Along the first function (accounts for 49% of variance) English departments are separated from biology departments and along the second function (accounts for 35% of variance) state institutions are separated from public institutions. In this case, differences in perceived influence are more attributable to discipline than to university type. The third function is not significant.

In summary, when DFA was used to discriminate discipline in combination with another structural variable, highest degree and department size accounted

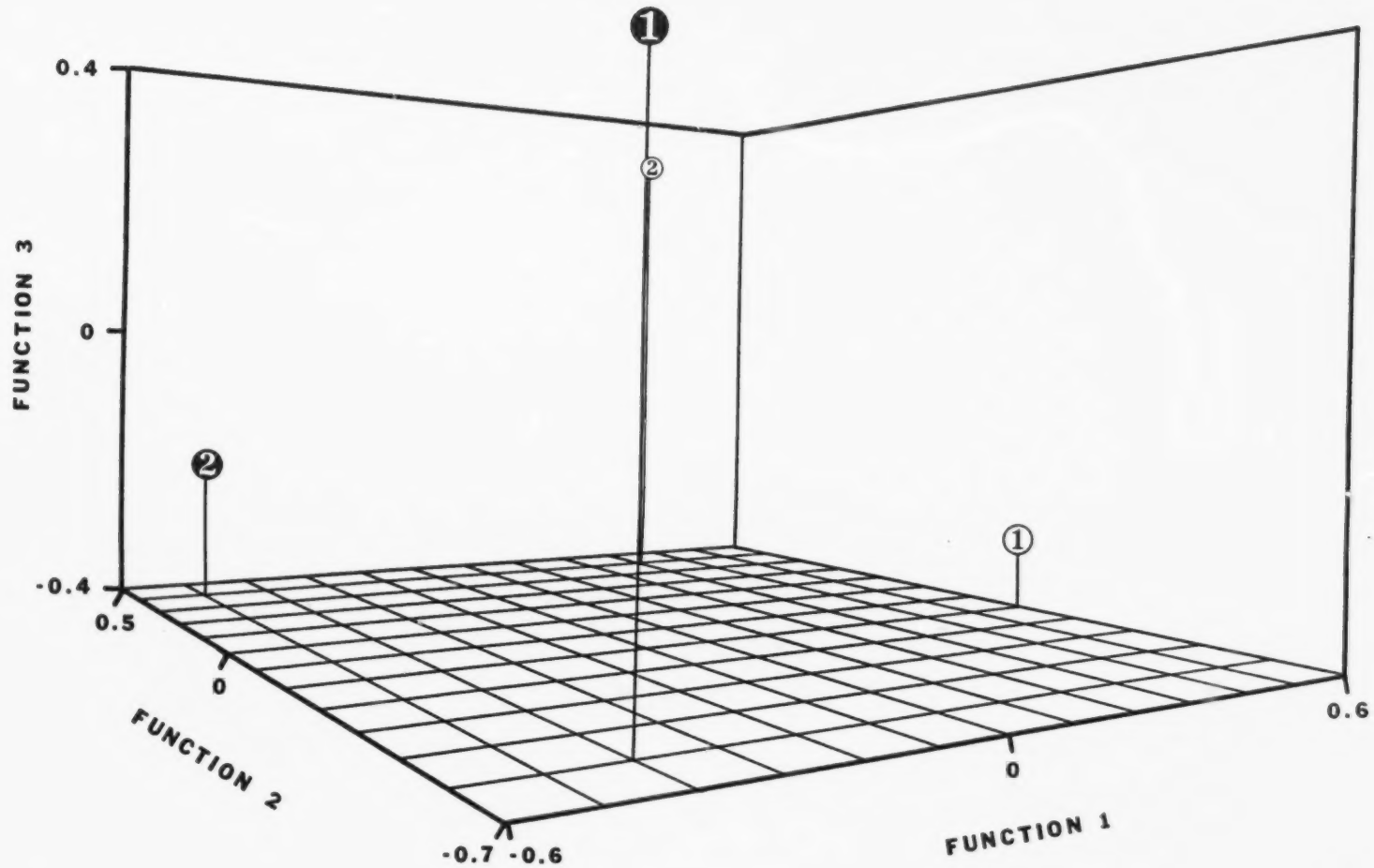


Figure 3. Group Centroids (Discipline, University Type): Discriminant Functions Generated from the Variables Dealing with the Perceived Influence of the Chairperson. Biology = closed circles; English = open circles; Private = 1; Public = 2. Separation of group centroids in multivariate space is significant at $P < 0.01$ (pair-wise F-test).

for more of the variance than did discipline with discipline accounting for more of the variance than university type. The next question is whether each of the variables, or whether each function is defined by a common or a different set of perceived influences. The 5 variables with the highest Standardized Canonical Discriminant Function Coefficient (SCDFC) for the first two functions of each of the three analyses (Discipline: Figure 1, Function 2; Figure 2, Function 2; Figure 3, Function 1. Highest Degree: Figure 1, Function 1. Size: Figure 2, Function 1. University Type: Figure 3, Function 2.) are listed in Table 5. These variables are easily divided into two groups: those occurring above the double line in the table are the ones which best discriminate the disciplines. Those below the double line discriminate groups defined by highest degree, size, and university type. An examination of this table makes it clear why it is possible to distinguish between discipline and highest degree or discipline and size or discipline and university type but <u>not</u> possible to distinguish between highest degree, size, and university type using DFA. The numbers in the body of the table indicate the ranking of variables by SCDFC. The abbreviation in parenthesis next to each number indicates which subgroup had the highest mean score on that particular variable. For example, among the top 5 variables which discriminate the disciplines, the chairperson's perceived influence over teaching loads was the variable with the highest SCDFC and on average the biology chairperson felt that they had more influence over teaching loads than did English department chairpersons. Influence over faculty salary decisions was the variable with the highest SCDFC for highest degree with the Ph.D. degree granting institutions having the highest mean. That same variable had

TABLE 5

Variables with the Highest SCDFC* for the First Two Functions from Figures 1, 2, and 3

Area of Influence	Discipline	Highest Degree	Size	University Type
Teaching loads	1 (Bio)		3 (Med)	
Institution-wide policy	2 (Eng)			
Procurement of Research Funds	3 (Bio)			
Faculty Promotion Decisions	4 (Bio)			2 (Pub)
Recruitment and Hiring	5 (Eng)			
Faculty Salary Decisions		1 (PhD)	2 (Lg)	5 (Pub)
Resource Allocation		2 (PhD)	4 (Lg)	
Class Scheduling		3 (Mas)		3 (Pub)
Committee Assignments		4 (PhD)	5 (Lg)	
Curriculum Development		5 (Bch)	1 (Sm)	1 (Pri)
Reappointment Decisions				4 (Pub)

* The Standardized Cononical Discriminant Function Coefficient associated with each variable is a measure of the relative importance of the variable to the function.

the second highest SCDFC in the analysis of discipline and department size with the largest departments having the highest mean. In the analysis of discipline and university type, that same variable had the 5th highest SCDFC; those chairpersons from public institutions had the higher mean.

DISCUSSION

The results presented in the preceding section clearly support the Biglan model in that there are differences between biology and English departments with respect to the perceived influence of the chairperson. These data go on to establish three other major points: (1) the structural variables of highest degree offered by the department and department size are each more important than discipline when compared with respect to perceived influence; (2) those areas of influence which best discriminate between biology and English department chairpersons are different than those which best discriminate between groups defined by the other structural variables; and (3) there is a great deal of redundancy among those variables which distinguish among groups defined by highest degree, size, and university type.

These findings have wide reaching implications for professional development programs for department chairpersons. The detailed analyses presented here with respect to the perceived influence of chairpersons are representative of findings with respect to decision making, perception of working conditions, perception of administrative roles, priorities, and several other factors (Hayward, unpublished data). All of these findings point to the conclusion that individuals planning professional development programs for department chairpersons should carefully consider a number of factors in order to best serve the needs of the intended audience. For example, if these results are indicative, a professional development program

which was carried out within a single institution or among chairpersons from institutions offering the same highest degree, chairpersons from departments of similar size would have more in common with one another than with those from similar disciplines. If, on the other hand, the professional development program were designed for chairpersons from departments of approximately the same size and offering the same terminal degrees, the discipline from which the department chairman came would be the best common denominator regardless of the type of institution (public or private) in which the department was located.

The present study, in addition to confirming the work of Biglan and others, has explored the application of DFA to the problem of distinguishing among the effects of discipline, department size, highest degree and university type as they are expressed through the responses of department chairpersons to a questionnaire. The results presented here represent only a first step, but it is an important one: that discipline is frequently of secondary importance in explaining the variance in responses of department chairpersons to questions dealing with perceived influence. Preliminary analyses of additional data indicate that discipline may be less important than all three structural variables with respect to decision making, budget-related tasks, and current conditions.

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